

IAP20 Record NO 15 NOV 2006

## CONDUCTIVE BUTTONHOLE INTERCONNECT

## BACKGROUND OF THE INVENTION

5 1. Field of the Invention

This invention relates to an interconnect system intended to permit the connection of an electronic device or power source to a fabric electric circuit embedded in a garment. More specifically, the invention relates to an electrical interconnect system having an electrical interconnect device incorporated into the garment in a location or locations most conveniently accessible to the wearer.

2. Description of the Invention

15 Integrated electrical switches for use in clothing are typically sewn, glued, or otherwise mounted to clothing using standard "off the shelf" electric components, deemed well known in the art. However, to the best of the current inventors' knowledge, the prior art devices in wearable electronic 20 applications do not address the problem of assuring simple and intuitive electrical connectors so as to be fashionable.

Therefore, the present invention relates to garment electrical connectors that can be realized in simple, intuitive, reliable, and inexpensive implementation. Moreover, the present 25 invention facilitates manufacture of such connectors as close as

possible to the manufacturing techniques used in the garment industry for widespread acceptance within the garment manufacturing industry.

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## SUMMARY OF THE INVENTION

The present invention discloses a wearable garment with an electrical interconnect system, which includes a buttonhole having at least one conductive outer edge mounted to the body of 10 the garment and a connector detachably coupled to the conductive areas of the buttonhole for coupling an external electronic device or power source. The electrical interconnect system of this invention incorporates a buttonhole that can be easily manufactured with conventional buttonhole machines. The 15 buttonhole is electrically coupled to a fabric circuit integrated in the garment material.

According to one aspect of the invention, a garment of desired form and function can be constructed in a conventional manner using readily available fabrics and materials, and the 20 electrical interconnect system can be positioned advantageously within a buttonhole that permits easy activation manually by a person. Necessary connection cables or cords can extend from the interconnect system for connection to an electronic device embedded in the garment material or an external power source.

25 According to another aspect of the invention, a button having at least one conductive outer edge is attached to a first

garment layer, which in turn is electrically coupled to a first fabric circuit integrated in the garment material. The button is releasably coupled to a button hole having at least one conductive outer edge attached to a second fabric circuit integrated in a second garment layer, such that the first and second fabric circuits of the respective layers can be electrically coupled together.

**BRIEF DESCRIPTION OF THE DRAWINGS**

10 Figure 1 illustrates an embodiment of an electrical interconnect system in accordance with this invention.

Figure 2 illustrates the electrical interconnect system of Figure 1 in accordance with a first embodiment of this invention.

15 Figure 3 is a detailed construction of the electrical interconnect system of Figure 1 and a connector in accordance with the first embodiment of this invention.

Figure 4 illustrates the electrical interconnect system of Figure 1 in accordance with a second embodiment of this invention.

20 Figure 5 is a detailed construction of the electrical interconnect system of Figure 1 and a connector in accordance with the second embodiment of this invention.

**DETAILED DESCRIPTION OF THE DISCLOSED EMBODIMENT**

25 In the following description, for purposes of explanation rather than limitation, specific details are set forth such as

the particular architecture, interfaces, techniques, etc., in order to provide a thorough understanding of the present invention. For purposes of simplicity and clarity, detailed descriptions of well-known devices, circuits, and methods are 5 omitted so as not to obscure the description of the present invention with unnecessary detail.

Referring now to Figure 1 of the drawings, a wearable garment 2 in accordance with this invention includes an electrical interconnect device 12 and a connector 16. The 10 connector 16 comprises a cable extending from the interconnect device 12, with the cable being coupled to a power source or other external electronic device. In the embodiment illustrated in Figure 1, the wearable garment 2 has the form of a conventional sleeveless top shirt, although it will be understood 15 readily that the shirt alternatively may be either long-sleeved, short-sleeved, vest, or jacket, for example. In addition, the materials of garment 2 may be either natural or synthetic, and the fabric created from such materials can be either woven or sheet-formed in any well-known manner.

20 Referring to Figure 2, one side of the garment 2 is provided with the electrical interconnect system 12, which includes an opening 10 defined by an outer ring 11 having one or more conductive area 11a at both ends thereof. The provision of the opening 10 to the fabric is well known to the skilled person, as 25 are variations in such attachment detail. The outer ring 11 is electrically coupled to a conductive track of a fabric circuit 4,

which may be provided in the form of loops to receive or otherwise engage equipment considered ancillary to the interconnect system 12, such as an external heart-monitoring device, external defibrillator, or other electronic devices.

5 Alternatively, such ancillary equipment or other electronic devices may be integrated in the garment 2 and used in conjunction with the interconnect system 12 for transmitting the desired signals or power in any well-known manner.

Referring to Figure 3, the connector 16 that allows the  
10 connection of a power supply or an external electronic device as described above comprises a button connector 40 having one or more conductive surfaces 40a that may be electrically coupled to the conductive areas 11a of the outer ring 11 for transmitting signals or power. As shown, the button connector 40 has a shape  
15 adapted to interconnect releasably the respective conductive areas physically and electrically with each other. Accordingly, a wearer can engage an ancillary device readily by merely mounting the button connector 40 with one hand to the proper opening of the garment. It will be understood readily by those having skill  
20 in this art, that in this embodiment of the invention, any connecting cable 16 extending from the button connector 40 can be coupled without difficulty to an ancillary device such as a cell phone, radio, pager, GPS device, personal communication assistant, or other signal transmitter or duplex interactive  
25 system, carried anywhere on the person of the wearer of the band.

Figure 4 illustrates the electrical interconnect system 12 according to another embodiment of this invention. As shown, one side of the garment 2 is provided with a button component 20 having one or more conductive area 20a. The conductive area 20a 5 of the button component 20 is electrically coupled to a conductive track of a fabric circuit 4. It is noted that the button component 20 in proper position on garment 2 formed by ordinary garment materials can be accomplished easily using well-known sewing and/or other fabric-attachment techniques. The 10 materials of such garment may be either natural or synthetic, and the fabric created from such materials may be either woven or sheet-formed in any well-known manner.

Referring to Figure 5, the button component 20 may be joined together with the outer ring 11a with a releasable locking action 15 by the wearer. In this embodiment, a wearer can engage the interconnect system 12 readily by merely fastening the button connector 20 of a first layer of the garment 2 to the outer ring 12 of a second layer of the garment 2. The two layers joined together can be made to be water-resistant or waterproof in the 20 area forming the interconnect system 12 to provide additional protection.

It should be noted that the conductive track of the fabric circuit 4 coupled to the button connector 20 may be provided in the form of loops to receive or otherwise engage equipment 25 considered ancillary to the interconnect system 12, such as a heart-monitoring device, defibrillator, and other electronic

devices that are integrated in the garment 2 and used in conjunction with the interconnect system 12 for transmitting the desired signals or power in any well-known manner.

While the preferred embodiments of the present invention have been illustrated and described, it will be understood by those skilled in the art that various changes and modifications can be made, and equivalents may be substituted for elements thereof without departing from the true scope of the present invention. For example, although an elliptical-shaped interconnect system is shown for illustrative purposes, it is to be understood that the present invention can support other shapes. Thus, the shape of an interconnect system in the drawings should not impose limitations on the scope of the invention. Therefore, it is intended that the present invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out the present invention, but that the present invention include all embodiments falling within the scope of the appended claims.